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In the case of an hyperbolic involution (c) these curves consist of two orthogonal systems of curves of normal compressions and tensions. If the involution is elliptic the orthogonal systems consist of curves whose tangents are all subjected to the same kind of normal stresses, *i. e.*, either to tension or to compression only. The first case is well known in graphic statics. Little attention has, however, been paid to the elliptic involution of stresses in a plane, and it will be interesting to illustrate this case by a few examples which strikingly exhibit the character of orthogonality of the curves of normal tensions.

If the material of a slab is only subjected to external tensions, the curves of normal tensions will resemble those of the adjoining figure.

As soon as the stresses in certain portions of the material exceed the strength of the material, the rupture of the material will take place along the curves of normal tensions, as it is evident from the figure.

This fact is beautifully illustrated by the cracks that form in a drying mass of mud along a river, where by the contraction of the mass only tensions are produced. It may also be observed on a heavily varnished surface, and in numerous other examples which depend only on tension.

In a future article the author intends to find orthogonal systems of normal stresses for a number of cases where the law of the distribution of specific stresses in a plane is a given function of the coördinates and of the angle of inclination of the line-element at a point.

DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ARITHMETIC.

126. Proposed by G. B. M. ZERR, A.M., Ph.D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

Bought 150 head of stock for $300, paying for each kind $2 5-6, $1 5-9, and $5-7, respectively. Find number of each kind bought.

I. Solution by MARCUS BAKER, U. S. Coast and Geodetic Survey, Washington, D. C.; H. C. WHITAKER, Ph. D., Professor of Mathematics, Manual Training School, Philadelphia, Pa.; COOPER D. SCHMITT, A. M., Professor of Mathematics, University of Tennessee, Knoxville, Tenn.; and CHARLES C. CROSS, Meredithville, Va.

The conditions are $x+y+z=150$, $2\frac{5}{6}x+1\frac{5}{9}y+\frac{5}{4}z=300$, and these to be solved in positive integers.

Eliminating x we have $\frac{23}{18}y+\frac{29}{42}z=125$; or

$$y=97-z+\frac{133-106z}{161}. \quad \text{Put } 133-106z=161a.$$

$\therefore\ z=1-a+\dfrac{27-55a}{106}$. Put $27-55a=106b$.

$\therefore\ a=-b+\dfrac{3(9-17b)}{55}$. Put $9-17b=55c$.

$\therefore\ b=-3c+\dfrac{9-4c}{17}$. Put $9-4c=17d$.

$\therefore\ c=2-4d+\dfrac{1-d}{4}$. Put $1-d=4n$.

$\therefore\ d=1-4n$; and by substituting through the various steps,

$c=17n-2$,
$b=7-55n$,
$a=106n-13$,
$z=21-161n$
$y=63+267n$
$x=66-106n$

} Here n may have *any* value, but $n=0$ alone gives positive integral values for x, y and z.

Therefore he bought of the

First kind,	66 at $\$2\frac{5}{6}$,	\$187
Second kind,	63 at $\$1\frac{5}{9}$,	98
Third kind,	21 at $\$\ \frac{5}{7}$,	15
	150	\$300

II. Solution by **S. F. NORRIS**, Professor of Astronomy and Mathematics, Baltimore, Md.; **SYLVESTER ROBBINS**, North Branch, N. J.; **P. S. BERG**, B. S., Principal of Schools, Larimore, N. D.; **M. A. GRUBER**, A. M., War Department, Washington, D. C.; and **ARCHIE C. MURRY**, Baltimore, Md.

Average price $=\$2.$		1st	2nd		Res't
$2\frac{5}{6}$	8	54	$33\frac{3}{5}$	$32\frac{2}{5}$	66
$1\frac{5}{9}$	15		63		63
$\frac{5}{9}$		35		21	21

Balancing gains and losses:

On 1 animal at $\$2\frac{5}{6}$, lose $\$\frac{5}{6}$; hence buy 8 animals at $\$2\frac{5}{6}$.
On 1 animal at $\$1\frac{5}{9}$, gain $\$\frac{4}{9}$; hence buy 15 animals at $\$1\frac{5}{9}$.] 1st.

On 1 animal at $\$2\frac{5}{6}$, lose $\$\frac{5}{6}$; hence buy 54 animals at $\$2\frac{5}{6}$.
On 1 animal at $\$\frac{5}{7}$, gain $\$\frac{2}{7}$; hence buy 35 animals at $\$\frac{5}{7}$. } 2nd.

NOTE.—To get required number, multiply 1st column by $4\frac{1}{5}$, and 2nd column by $\frac{3}{5}$.

Answer.		
	66 animals at $\$2\frac{5}{6}$ =	\$187
	63 animals at $1\frac{5}{9}$ =	98
	21 animals at $\frac{5}{7}$ =	15
	150 animals for	\$300